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Paper

4th *Generation Regulation – a new model of regulation for the digital ecosystem*

Work in progress, for discussion purposes

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Author: Alan Horne, ICT Senior Expert

1 Introduction

Regulation, regulation, regulation – you cannot pick up a paper, turn on your TV, or review the internet news without being aware that regulation is a key topic. Regulation of the finance sector, since the global financial crisis; regulation of the press, since the UK phone hacking case; regulation of cold calling and sending unsolicited short messages (sms) to customers. Such messages are sent from many highly competitive sectors such as lawyers and insurance brokers seeking to sell their services. And as with all social innovations, crime over the Internet has become an everyday occurrence presenting challenges for consumers, companies and nations alike. With the world's population clock[1] indicating just over 7 Billion people and advancing, these issues are becoming more relevant. Governments are facing increasing social and economic issues. Pressures are being put on health care, education, policing, employment, environmental protection and economic growth and, these issues are even more challenging in the developing world, all in the face of austerity measures.

It is widely accepted that effective communications, connecting people, as well as "things" and the provision of easy access to information can greatly assist society in tackling the issues we are facing. But, when there are many competing stakeholders vying for a piece of the action, appropriate regulations and Regulators are required to maintain a sense of order.

This revolution, the digitalisation of every aspect of national economies, has been enabled, in part, by policy driving the opening up and liberalization of markets since the late 80's coupled with advances in technology. In moving from a monopolistic to a competitive telecommunications environment, regulations and strong regulators have been required to enable new entrants to compete against dominant players with significant market share. Regulation[2] of the evolving telecommunications industry is not getting easier as the digital ecosystem (DE), emerging from the convergence between the Information Technology, Telecommunications, and Media and Entertainment Industries, grows in unpredictable technological directions. Telecommunication Regulators today are being challenged with an increasing array of issues reflecting the number and scope of services being carried over the digital networks and for which society demands regulation.

In chapter 3 of Trends in Telecommunication Reform, 2013, dealing with Spectrum policy in a hyper connected digital mobile world, the author Dr Bob Horton postulated there have been three generations of regulations. With slight modification to his hypothesis he suggests that monopoly, private or publically-owned and managed utilities, were overseen by 1st generation regulations with the intent to encourage improvements in efficiency and service – in effect regulations simulated competition. With part privatization and licensing of competing infrastructure the 2ⁿᵈ generation of regulations focused on ensuring the incumbent made its infrastructure available in a non-discriminatory manner, often under pressure to look after the interests of Government shareholdings. With full privatization and a move towards service rather than infrastructure competition the independent "3ʳᵈ generation" of regulations focused on net neutrality requiring protection of sustainable competition in services and with the growth in content delivery, an increased need for consumer protection arose.

Market and technology developments are now stimulating a move to 4ᵗʰ generation regulations to tackle a different challenge – a challenge of regulatory purpose. The established processes, for economic regulation of large market players, cannot easily be set aside. Governments (and society at large) are concerned that digital

infrastructures (particularly fixed and mobile access networks), are non-optional utilities whose availability and performance impacts on every aspect of the economy and societal development. Regulatory bodies are therefore required to be sensitive to the long-term risks of poor investment and market behaviour driven by short-term speculative pressures. The 'fourth generation regulator' is overseeing an increased range of services, delivered over broadband and progressively converged networks and forming the foundation of the digital ecosystem.

Increased services and convergence are being assisted by the ever increasing speeds of broadband networks with broadband wireless being delivered over systems adhering to the long term evolution (LTE) standard, often referred to as fourth generation mobile networks by industry. These broadband networks are enabling high quality content to be delivered as well as a vast array of more-interactive services. The 4th Generation Regulator, more than ever before, is concerned about consumer protection against such aspects as inappropriate material, mis-selling and fraudulent activities. Such is the importance of the Internet being delivered over the regulated broadband networks the 4th generation Regulator is increasingly involved in the social issues, the economic necessity of digital public services delivery and the new opportunities and challenges arising from better connected communities. This is particularly important in the developing world.

In this growing digital ecosystem how does the regulator address such matters as regulating individuals, businesses and "things", moving to 4th generation regulation, a new model of regulation based on consultation, complex collaborations and partnerships? How should the regulator balance efficiency, fairness and cost-saving to prepare for the digital cloud ecosystem? What approach should the regulator take in developing appropriate regulatory incentives, foster co-regulation, promoting regulatory incentives in addition to competitive measures such as smart allocation of spectrum for IMT (3G, LTE) – and, finally, is it enough just to have loose cooperation among individual national regulators?

This discussion paper addresses these questions in the context of a regulator working in the new global digital ecosystem. The paper draws on published papers and web sites which are referred to in the end notes. A broad international perspective has been taken with views being based on practices from a wide range of countries worldwide with a particular focus on developing countries. A number of examples are used of recent developments, which might be considered best practice, in regulators reacting to and preparing for the future.

This paper is structured into 6 sections with Section 1 providing an Introduction, Section 2 addresses the changing environment in which the Regulators find themselves, Section 3 addresses public policy, Section 4 discusses the evolving role of regulators, Section 5 then proposes the shape of the 4th generation regulation and finally Section 6 makes conclusions.

2 The changing environment

The focus of activities for a Regulator changes as the environment in which they are working evolves. This section addresses the changing environment in terms of technology, networks, suppliers and consumer services. Section 3 addresses changing public policy. Box 1 depicts the key areas of change and stakeholders involved in the digital ecosystem.

2.1 Technology development

There has been a significant advance in technology used in telecommunications networks. It might be argued that the advances have been stimulated from operators seeking cost savings and an increase in the capability of the technology solutions and systems. The need to seek cost reductions and increased capability has come about by the need for operators to improve their competitive advantage.

The top international vendors have risen to the challenge and are all driving advances in technology offering ever faster and cheaper fixed and wireless network systems based upon internet protocol (IP). Such advances have been underpinned by cooperation in developing new standards.

Box 1: Changing Environment
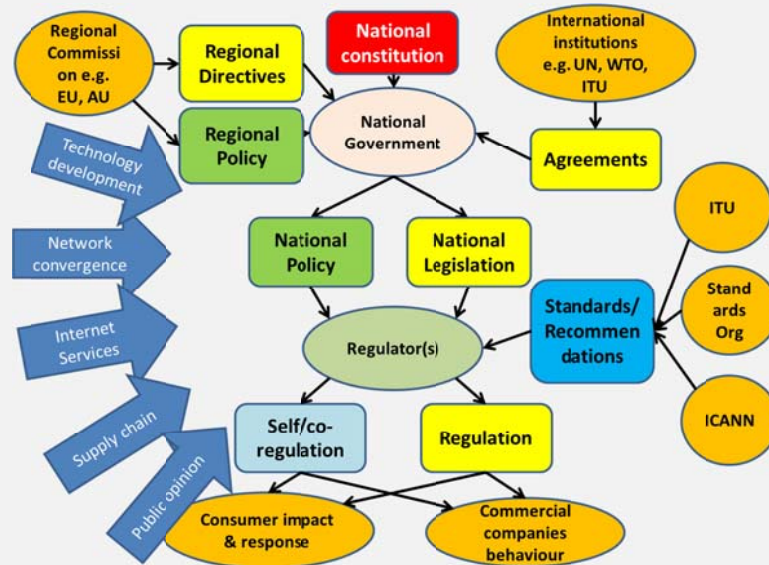
Source: Alan Horne

Standards making and in particular the 3rd Generation Partnership Project (3GPP[3]), has played a key role in ensuring an international standard for the Long Term Evolution (LTE) mobile system. 3GPP unites six telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TTA, TTC), known as "Organizational Partners" and provides their members with a stable environment to produce the highly successful Reports and Specifications that define 3GPP technologies. ITU standards (called Recommendations) are also fundamental to the operation of today's ICT networks. For Internet access, transport protocols, voice and video compression, home networking, and myriad other aspects of ICTs, hundreds of ITU standards allow systems to work – locally and globally.

The high speed broadband fixed, 3G and now LTE or 4th generation wireless connectivity, has enabled the progressive development of ever increasingly smarter phones and terminals and an increasing range of applications and services. The IP broadband network not only enables mobile and fixed voice calls but also high speed internet connection. Consumer can now have any time anywhere access to online applications and services.

The ITU have allocated a wide range of spectrum bands to International Mobile Telecommunications (IMT)[4]. It is in fact the advances in technology that has allowed economical multi-band radios to be produced and used in mobile telephones and other devices. The release of additional spectrum, the "digital dividend" from analogue TV to digital TV has also been a major boost for the telecommunications industry. ITU estimates[5] that by end of 2013, the number of fixed-broadband subscriptions will have climbed to more than 688 million, corresponding to a global penetration rate of 9.8 per cent. At the same time, the number of active mobile-broadband subscriptions grew by 21 per cent between 2010 and 2013, to an estimated 2.1 billion by end of 2013; representing nearly three times the number of fixed-broadband subscriptions, but still much fewer than total mobile subscriptions, which will reach an estimated 6.84 billion by end of 2013. ITU estimates show that mobile broadband penetration in the developing world will reach 20 per cent while penetration levels in the developed world will represent 75 per cent by end 2013. Total global Internet users will reach an estimated 2.7 billion worldwide by end of 2013. In developing countries, the number of Internet users will have more than tripled between 2007 and 2013, to reach more than 1.8 billion.
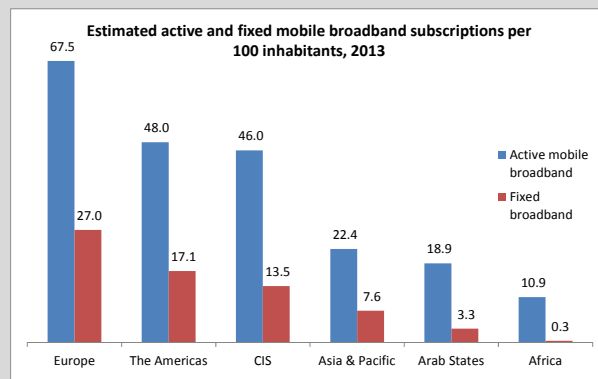
Despite this rapid growth, however, less than a third of inhabitants in the developing world will be online by end of 2013. There is still a major job to be undertaken in connecting the unconnected.

The balance has shifted from the provision of services over fixed line infrastructure to the home, to delivery over wireless technology to the individual. This is highlighted in Figure 1.1 in the ITU Trends in Telecommunications Reform Report[6], May 2013 (See Box 2) where the active mobile broadband subscriptions has progressively exceeded the active fixed (wired) broadband subscriptions since 2008 and the percentage penetration of fixed and mobile broadband. This indicates that in the developing world the mobile is even more important than fixed. Indeed it is quite likely there will never be any fixed line services in many areas of the world.

The development of battery technology, touch screens and memory has enabled the development of smart phones and tablets with significant processing capabilities. Research companies such as NPD[7] and IDC[8] are reporting that around 900 million, 50% of the total mobile phones sold in 2013, will be smart phones.

The technological development in high speed reliable broadband enables applications to be run centrally or within the "cloud computing". The ITU Trends 2013 dedicates a chapter (Chapter 7 The cloud data protection and privacy whose cloud is it anyway?) to this subject.   Applications used by consumers are requiring personal data to be stored or accessed. This personal data is typically stored in another legal jurisdiction from the customer.

Box 2 - Global ICT trends and broadband penetration, 2008-2013

Estimated active and fixed mobile broadband subscriptions per 100 inhabitants, 2013

	Active mobile broadband	Fixed broadband
Europe	67.5	27.0
The Americas	48.0	17.1
CIS	46.0	13.5
Asia & Pacific	22.4	7.6
Arab States	18.9	3.3
Africa	10.9	0.3

*Note: *2012 and 2013 data are based on estimates.*

Source: ITU World Telecommunication/ICT Indicators database.

The emergence of broadband communications has resulted in content, prepared by consumers as well as public broadcasters, being distributed over the same integrated networks. Consumers can listen to radio, watch live TV, and take part in a live video conference or download videos. The source of such services most likely will be from off shore.

2.2   Network convergence

With the pressure to cut costs and given the technology development, operators are progressively merging their networks so that calls originating from a mobile or fixed line telephone or data terminal are carried over the same IP based core network. Box 3 presents a diagram depicting a converged broadband digital world.

The main difference between mobile and fixed services lies in the access network and whether the customer's terminal is connected to the public network by a fixed connection (copper, cable or optical fibre), cellular wireless system or wireless system such as WiMax. A converged network enhances the possibilities of increasing efficiencies in the provision of services and use of scarce mobile spectrum. For example a mobile call or internet session can be handed over to the fixed network as the customer's terminal moves into the range of a Wi-Fi or WiMax signal.

Whilst the core networks can operate using packet switching, the interfaces for both mobile and fixed voice users are still largely using circuit switched technology. Although this is changing for fixed access using MSANs,

interconnection between competing networks is still performed using circuit switched technology and C7 signaling. This should progressively change as the commercial relationship on IP interconnection is sorted out.

Box 3: Services over a converged network

Source: Alan Horne
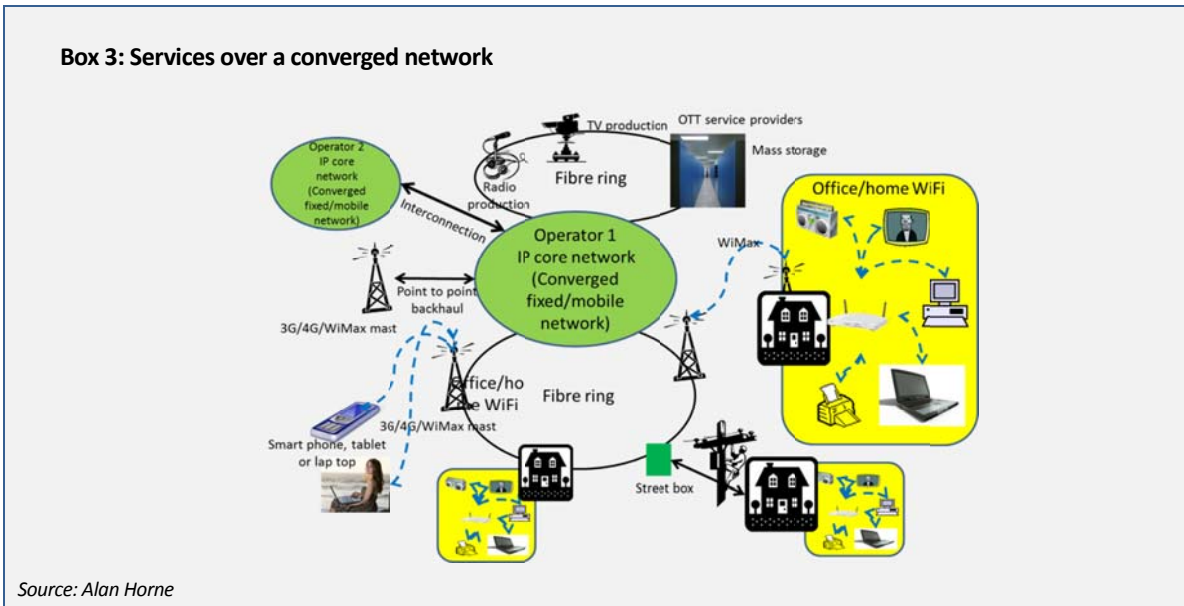
Interconnection of networks has a potential to be simplified using IP interconnection and easing the commercial relationship between operators.

2.3   Internet Services

Supported by the growing number and capability of smart mobile phones and higher speed broadband networks, services provided over the internet have experienced significant growth.

The high speed internet services, offered by the IP based networks, have provided new opportunities, as well as challenges, to many industries including TV, music and news not to mention every conceivable service industry that can now sell its products over the internet. Witness the changing face of the high street with increasing impact of ecommerce and on line shopping.

The advances in the capability of the network have enabled the development of new value added or over the top (OTT[9]) service providers. A multitude of applications are being offering by such OTT content and services providers developing new sources of revenues. The growth in OTT services has challenged the business models of infrastructure providers. Voice over IP services, such as Skype, could be argued to be as much an application as a weather outlook or interactive game. The introduction of unlimited broadband services by the network operators, exploiting the advances in technology but not adjusting appropriately their charging plans, has enabled OTT services to benefit.

Licensed operators of telecommunications service are lobbying for some OTT services such as VoIP provided by Skype to be licensed. Their argument is that such voice services are a licensable activity and the providers should be subject to the same terms as they are. However in most cases the VoIP services in fact fall outside of the existing definition as they are not directly selling any voice service but rather the service is being accessed over a licensed national network. Such VoIP service providers are not using any scarce resources such as numbering, spectrum or access to land. They argue that the customer is paying the licensed service provider for internet connectivity and they are also paying to be connected to licensed operators. Their service results in data being passed between operators which are dealt with under the interconnection arrangements.

The OTT service providers are providing the services that consumers want to buy. The network operators are benefiting with the increased demand for broadband services. The VoIP operators argue that licensed infrastructure operators should get their pricing right for their pipes and they are a stimulus for people upgrading to broadband services. Competition and the increasing capability of the technology, have required and enabled operators to evolve from the provision of plain old telephone service (POTS) to the provision of broadband services including voice, data, internet, video, live TV, games, social networks and the list goes on. However a new approach is required by operators of converged digital networks in order to properly fund their networks and work with OTT operators as partners in assisting them achieve a fair return on capital employed.

Social networking internet sites have provided a new way for people to communicate and share ideas. The eBusiness[10] Knowledgebase web site provides a ranking of top 15 social networking sites. In May 2013 750 million different people in the world used Facebook alone., eBusiness ranks the top 10 web sites in May 2013 to be Google, Facebook, Yahoo, YouTube, Wikipedia, msn, Amazon, eBay, Twitter and Bing.

Nielsen Study on how Americans use their media time [11] in 2012 indicates the number of people who have "cut the cord" and no longer watch video via broadcast, cable or satellite TV. The apartments they live in are among more than five million U.S. homes that, according the Nielsen study, have "zero TV" up from just over 2 million in 2007.

Banks have cut costs and offered banking services over the internet. There is now a steady rise in the use of the mobile for financial transactions developed partially out of the pre-paid application. Mobile payment is also referred to as mobile money, mobile money transfer, and mobile wallet. These finance transactions and services are operated under financial regulation and performed from or via a mobile device. In the developing world where the majority of people do not have bank accounts and have not been able to take advantage of financial transactions, mobile money offers a significant opportunity. In developing countries mobile payment solutions have been deployed as a means of extending financial services to the community known as the "unbanked" or "under banked," By 2017, Juniper Research estimate (published in January 2013) that more than 1B mobile subscribers (15% of global mobile subscribers) will use mobile banking. The mobile operators are seeing a significant revenue opportunity to get involved in the financial sector. In turn this is involving the telecommunications and financial regulators working together to ensure consumers are properly protected in a coordinated way.

Near field communication (NFC), is a form of contactless communication between devices like smart phones or tablets. Contactless communication allows a user to wave the smart phone over a NFC compatible device to send information over the internet without needing to touch the devices together or go through multiple steps setting up a connection. NFC technology is enabling a host of new services to be developed and introduced to assist transactions, for example swiping a smart phone at the checkout lane in the supermarket or buying a theater ticket or sharing the latest game with a friend.

The proliferation of broadband and the digitalization of content are bringing about a profound and rapid transformation of the media/content landscape, which may change regulatory functions. Russia, for instance, has issued several Internet Protocol Television (IPTV) licenses. It is quite common for a radio "chat show" to take a call from someone living overseas and listening to the program on the Internet. Both the Russian TV and the chat show channels are licensed but many service providers are not. The aggregate audience for the unlicensed self-produced and "long tail" content is growing for example in March 2013, YouTube's world wide audience[12] exceeded 1 Billion monthly unique users. To put this in perspective the Broadcaster Audience Research Board[13] (BARB) in May 2013 indicated that on average 43.779 Million people per day watched UK TV out of a total of around 60 million people. .

2.4 Supply Chain

With the removal of restrictive practices and the opening up of increased competition in the supply side has been a rationalization in equipment manufacturers. There are now only a handful of providers with the top few global players providing network equipment and services to the telecommunication companies[14] including Alcatel-Lucent, Alvarion, Cisco, ECI Telecom, Ericsson, Fujitsu, Huawei, Juniper Networks, Nokia, Marconi, Qualcomm and

ZTE. Fewer bigger equipment providers operating on a global basis has assisted the cooperation in developing harmonised standards and development of technology with greater economies of scale.

Many developing regions face increasing regionalisation of their telecommunications markets. Such international telecommunications groups as Bharti Airtel, America Movil, Telefonica, Millicom International Cellular, Etisalat, MTN, Qtel, Digicel, Cable and Wireless, Vodafone and Vimpelcom span across a number of countries in their respective regions. Such trends have benefits but impact the environment for the regulator including:

1. No local regulatory staff in country for the regulator to interface with.
2. Regional or corporate regulatory affairs groups with regional regulatory policy interests taking precedence over local considerations.
3. Regional marketing and pricing strategies.
4. Regionalisation or internationalisation of services and branding.
5. Cost Reduction via economies of scale and central execution of activities including: Aggregation of procurement activities; Sharing IT platforms; Centralized billing; Traffic internalisation and aggregation for international connectivity; Customer Support / Call centres and Data centres.
6. Efficiencies due to integrated corporate structure, sharing of expertise with the same individuals responsible for multiple jurisdictions.
7. Centralised strategic decisions;
8. National companies share the same boards.
9. Integrated regional networks and technology transfer.
10. Integrated disaster preparedness and recovery policies.

Such regional and international operators have the potential to cross subsidise using profits in one country to sustain anti-competitive activities in another. Such techniques can also assist in minimising taxes.

The dominant players are no longer the incumbent but companies such as Apple and Samsung, with their smart phones and tablets and Google and Microsoft, with their software applications and platforms. These new companies are increasing their value many fold whereas the infrastructure players are struggling to stand still. There has been a quantum change in the value chain where the software and application service providers dictate to the infrastructure players.

With the development of a few regional and global operators and equipment suppliers comes the issue of potential anti-competitive behaviour through companies gaining significant market power (SMP). Global suppliers, with their significant market power, could for example, drive the network operators to change technology for their own end. This can be achieved with such practices as stopping the support of the older technology.

3 Public policy

3.1 Constitution

Society has defined rules of behaviour, covering such areas as freedom of speech, right to equal access to public services, right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author (copyright) and the right to regulate. Such rules are set out in constitutional documents such as the Universal Declaration of Human Rights[15], by the United Nations (UN), or the Constitution[16] of the United States of America (USA). These rules take a significant time to agree and changes are not quickly made. They guide policy makers and regulators and are generally technology neutral i.e. they should not change with advances in technology or unduly favour choices in their selection.

Policy makers and regulators have, for better or worse, in the past been influenced by technology in drafting policies and regulations. However unlike Constitutional documents Polices and Regulations are more easily changed, but still take quite some time. Consequently with the significant advances in technology there has been a tendency for some policies and regulations to become obsolete or irrelevant e.g. to segment the market and

Licence operators limiting them to specific technologies in specific frequencies such as cable, 2G mobile and Value Added Supplier (VAS) or Internet Provider.

Public policy objectives for the different aspects of communications should support achievement of constitutional statements. There are common themes in the policies for different aspects of communications policy such as equal access and being accessible to all. There are also uniqueness's such as for broadcasting there is a public policy of balanced reporting whereas for telecommunications there is a public policy controlling interception of communications.

3.2   International Agreements

At an international level there are a number of important institutions, societies and forum influencing national policy including the United Nations (UN), World Trade Organization (WTO), ITU, World Economic Forum (WEF), Internet Corporation for Assigned Names and Numbers[17] (ICANN) and the internet society[18] (ISOC).

The eight UN Millennium Development Goals (MDGs)[19] can be greatly assisted through ICT Policies. The World Summit on the Information Society (WSIS) forum 2012[20] set out actions to assist nations achieve MDGs. The WTO Agreement on Basic Telecommunications Services, published in 1997, provided a new framework promoting binding commitments on market access from its members with a statement of "pro-competitive regulatory principles" that rapidly become the definition of the policy revolution in the sector. The Broadband Commission for digital development[21] has established goals to achieve digital inclusion for all. These goals are being taken up in national policies and implementation is being supported by Regulators. In September 2012 the Commission issued a report[22] on the state of broadband 2012, achieving digital inclusion for all.

The World Conference on International Telecommunications (WCIT[23]) (resolution Plen/1 Dubai 2012) set out special measures for landlocked developing countries and small island development states for access to international optical fibre networks. The new Treaty of the International Telecommunication Regulations (ITRs), hotly debated at WCIT, is a good example of an open and transparent debate by ICT stakeholders influencing policies of Governments. The treaty will come into effect on the 1st of January, 2015 for the countries which have or will have signed up to it. Important issues were debated. During the Fifth World Telecommunication/ICT Policy Forum (WTPF), that took place in May 2013, discussions continued and focused on international Internet-related public policy matters. As noted by the President and CEO of ICANN, at WTPF – 13, "no one organization, no one country, no one person can manage the Internet – we must do this together. And it's our unity that will make this a very strong Internet that is secure and stable for everybody."

3.3   Regional Policy and Directives

Regional bodies are similarly setting out ICT Policies such as the European Union (EU) Digital Agenda[24] for Europe. The ITU are supporting regions such as Africa in their programme on Harmonization of the ICT Policies in Sub-Sahara Africa [25](HIPSSA), ICB4PAC in the Pacific and HIPCAR in the Caribbean.

Many countries and regions are taking steps to develop their economies through maximizing the use of ICT. One example at a regional level is the Digital Agenda[26] for Europe (DAE) which aims to reboot Europe's economy and help Europe's citizens and businesses to get the most out of digital technologies. It is the first of seven flagships initiatives under Europe 2020, the EU's strategy to deliver smart sustainable and inclusive growth. The review published on 18th December 2012 identifies 7 key areas for further efforts to stimulate the conditions to create growth and jobs in Europe:

1. Create a new and stable broadband regulatory environment.
2. New public digital service infrastructures through Connecting Europe Facility loans.
3. Launch Grand Coalition on Digital Skills and Jobs.
4. Propose EU cyber-security strategy and Directive.
5. Update EU's Copyright Framework.
6. Accelerate cloud computing through public sector buying power.

7. Launch new electronics industrial strategy – an "Airbus of Chips".

Full implementation of this updated Digital Agenda, the EU estimate, would increase European GDP by 5%, or 1500€ per person, over the next eight years. They estimate it will achieve this by increasing investment in ICT, improving eSkills levels in the labour force, enabling public sector innovation, and reforming the framework conditions for the internet economy. In terms of jobs, they estimate that up to one million digital jobs risk going unfilled by 2015 without pan-European action while 1.2 million jobs could be created through infrastructure construction. This would rise to 3.8 million new jobs throughout the economy in the long term.

The EU Digital Agenda contains 13 specific goals which encapsulate the digital transformation the EU wishes to achieve. Progress against these targets is measured in the annual Digital Agenda Scoreboard. The EU issues Directives which are required to be implemented by the 27 member states. The African Union (AU), with its 54 member states, has some powers over its members. In most cases regional bodies do not have the same level of power as the EU, such as the Arab League of 22 countries, due to a lack of enforcement mechanisms such as a judicial court. However, the discussions held at the ICT Arab League Permanent Committee for ICT, are important in influencing Public Policy and as a regional harmonization mechanism. The 32nd meeting, held in Doha in March 2013, covered a number of subjects of common interest including the Arab Dialogue on Internet Governance (ArabDIG) Initiative, the Arabic Top-Level Domains Project and the Arab Internet Network Linkage Project. Discussions focused around policies and actions to enrich the production and usage of Arabic e-content, written, auditory and visual, on the web accessible via fixed and mobile devices. The policies are to support sustainable development of an Arab knowledge society while maintaining the Arab, Islamic identity.

Similarly the Asia Pacific Telecommunity Regulatory Forum[27] (APTRF) assists APT's 32 members establish Public Policies and action plans in ICT. APTRF brings together the ICT policy makers and regulators from the region together for dialogue on common issues.

Further the Summits of the Americas are institutionalized gatherings of 25 heads of state and government where leaders discuss common policy issues, affirm shared values and commit to concerted actions at the national and regional level to address continuing and new challenges faced in the Americas. One common issue being actively debated is the cooperation in introducing common legislation to deal with cyber crime[28].

3.4 Public opinion

Governments are elected by the people and their policies are largely driven by public opinion. Of interest to all is the ability to work and earn sufficient money in order to be able feed the family and remain in good health to support economic and social policies of government. Public opinion has stimulated Governments to step into the debate on such matters as over use of the broadband network for sales and marketing using sms, internet and automatic outbound dialing. One such example is the "Do-not Call"[29] Law passed by the Florida State which arose out of public pressure.

The Internet Society[30] fosters an environment for international cooperation, community, and a culture that enables self-governance of the internet to work. Their work is authoritative and will impact government policy. Further there is a growing number of people and institutions involved in Community Informatics (CI). CI is primarily concerned with improving wellbeing of people and their communities through more effective use of ICTs. It is formally an academic discipline within a variety of academic faculties including Information Science, Information Systems, Computer Science, Planning, Development Studies, and Library Science. It involves people across many disciplines interested in the utilization of ICTs for different forms of community action, as distinct from pure academic study or research about ICT effects. This group is internationally connected and forms a growing authority of opinion which will, if they have not done so already, influence government policy.

3.5 ICT Policy

In one form or another every nation should have a set of policies covering ICT.

Governments have observed the benefits of broadband networks connecting communities to the Internet assisting communities in terms of health and education, as well as social and economic development. In recognition of the social and economic benefits being brought about by high speed communications networks, Governments are viewing broadband internet access as a right and not a luxury and are developing national ICT and broadband policies. According to the OECD[31], countries leading in broadband penetration rates have typically established national broadband policies. The OECD report sets out that the top 8 overall ICT policy priority areas are: Broadband, ICT skills and employment, Government online, Security of information systems and networks, Research and development (R&D) programmes, Technology diffusion to business, Electronic settlement/payment and Digital content.

The Pacific Islands Forum Secretariat (PIFS) in collaboration with the Secretariat of the Pacific Islands Applied Geoscience Commission (SOPAC) and the Secretariat of the Pacific Community (SPC) commissioned a review of the Digital Strategy early in 2010 which resulted in a Framework for action for ICT development in the Pacific[32] . This has formed the main input into the Policies of Governments in the region. A further example is the Ghana National Telecoms Policy[33] which includes an overarching objective to have a "Fully open, private and competitive market for telecommunications services." This would imply there are no constraints on the number of providers. The Malta Communications Policy includes in its objectives "An adequate number of General Interest Objectives (GIO) broadcasters, balanced against minimal distortion of market mechanisms" implying the number of operators will be constrained. For Radio spectrum one of the goals for example of the United States is to best utilize this limited resource in such a way that will bring about the "highest and best use[34]". Conversely for broadcasting by way of example South Africa[35] "A primary object of broadcasting policy is to ensure public interest values of access, diversity, equality, independence and unity as well as fundamental human rights contained in the Constitution." Broadcasting policy for radio, television, broadcasting distribution and new media has similar objectives to telecommunications. Additional objectives include diversity, balanced reporting, promotion of national broadcaster's programmes, and promotion of the nation and distribution of public notices.

The Kenyan government has, for example, underscored universal access to ICTs as a major objective of Vision 2030 – Kenya's economic blueprint that is aimed at propelling Kenya from a developed to a middle-income country. The Seychelles National ICT Policy[36] sets out a typical ICT Policy Vision and Mission Statement. The Minister of Communications of the Government of South Africa established an ICT Policy Review Panel in November 2012 with the brief to take into consideration an integrated approach to address convergence of ICT services and produce a new National ICT policy. These are just a few examples of Governments developing ICT Policies.

4   Evolving Role of Regulators

This section reviews the impact on the regulator as a result of changing and evolving environment and public policy, as set out in the previous sections. The role of the regulator is directly being impacted by the trends of technology convergence and changing face of competition from different suppliers with new entrants, mergers and acquisitions. (Box 4). Section 5 will focus on the key aspects going forward which are having a profound effect on the 4th Generation regulations and Regulator.

Box 4: Evolving Role of Regulators
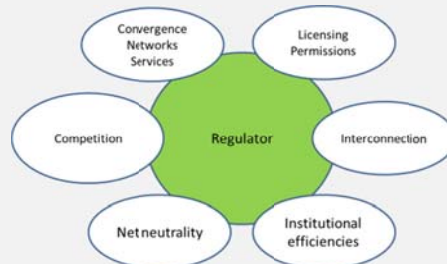
Source: Alan Horne

4.1   Competition and Services

As of mid- 2013 over 161 countries, in liberalizing their telecommunications markets, have established separate telecom/ICT regulators. Competition is now the norm in most ICT markets throughout the world.

The range of different sectors offering services over broadband networks is requiring the Regulator to work closer with different interest groups and authorities. The advent of new services are raising basic questions about how such services should be regulated; can old models be applied or is a new approach needed? In the growing network environment, however, while a progressive policy framework to govern the physical infrastructure is necessary, it is not sufficient. Networks are ultimately set up to deliver services. Regulators have to face the challenges that these new services and applications bring.

In theory regulators should be moving from ex ante regulation to ex post and more reliance on general competition law/regulation. However, the market is consolidating as each country has one or sometimes only 2 fixed infrastructure competitors and a reducing number of mobile network providers. Mobile, which was largely unregulated, is offering serious competition to fixed providers to the extent that they now dominate the call origination market Regulations and approach by regulators and governments have to be based upon sound competition principles and outcomes so as to be flexible enough to cope with the changing fortunes of different market players.

The ITU GSR 10 Best Practice Guidelines for Enabling Open Access[37] addresses the regulation concerning the right balance between service competition and infrastructure competition to address the challenges associated with access to broadband networks and services. This includes ensuring equal and non-discriminatory access to the networks and lifting potential bottlenecks.

Creating the environment to provide consumer choice of services and providers has been a fundamental function of regulators. In a competitive digital environment with higher and higher broadband services the challenge comes in ensuring universal service or in developing countries, universal access to such competitive services. It has to be recognised that due to rural characteristics, such as low population density, distance from urban and back bone networks and often challenging terrain, it may not be economic to have competitive infrastructure but only choice of services, including from OTT providers. The choice of OTT services will be maintained through ensuring network neutrality. However choice of mobile operator services is often prevented by operators fighting hard against any regulation to allow their infrastructure being used by other national operators.

In spite of regulatory requirements, interconnection, roaming, infrastructure sharing and access are areas which have been used by established operators to inhibit competition or maintain competitive advantage and higher prices. Regulators oversee the licensed companies providing telecommunications networks and services and have been challenged by many of these issues delaying a truly competitive market. Regulators have in many cases forced infrastructure sharing but generally only succeeded at the passive level such as mast or duct sharing. However, where there has been established a structurally separate broadband network available to all operators on wholesale terms, then full infrastructure sharing can be achieved.

Regulators and local incumbent operators can be at a considerable disadvantage when faced with a global operator entering the market. The global operator has cost and strategic advantage over the local incumbent which can considerably assist them gaining market power. The global player can afford to field highly qualified regulatory lawyers and staff to confront the regulator. Operators are able to use profits from one country to subsidise prices in another, rapidly increasing market share and dominating the subsidised market. Retail price subsidy from both overseas and highly profitable (lightly regulated) Mobile Call Termination Rates, increases the level of mobile to fixed or fixed to mobile substitution. Operators can use internal accounting between parent accounts and subsidiary company accounts. Often common services are provided for free from the parent company to the local subsidiary. Capital equipment may be purchased through central contracts with volume discounts not open to local former incumbent operators even when they have a strategic partner.

Regionalisation and globalisation can bring many advantages in cutting costs and bringing in new services. Regulators have to respond if operators exploit the rules to their own advantage and distort markets. However regulators should ensure they do not hold back investments and change but rather support such market driven advances whilst ensuring anti-competitive activities are prevented.

Production of "Code of Practice" or "Guidelines" on what the Regulator views as anti-competitive activities and how they will react, can assist operators. Examples of such Codes include the Code of practice for competition in telecommunications services from iDA,[38] the Singapore Regulator. This is representative of many such Codes and has the objectives to:

1. promote the efficiency and competitiveness of the information and communications industry;
2. ensure that telecommunication services are reasonably accessible to all people, and are supplied as efficiently and economically as practicable and at performance standards that reasonably meet the social, industrial and commercial requirements;
3. promote and maintain fair and efficient market conduct and effective competition between persons engaged in commercial activities connected with telecommunication technology;
4. promote the effective participation of all sectors of the information and communications industry;
5. encourage, facilitate and promote industry self-regulation in the information and communications industry;
6. encourage, facilitate and promote investment in and the establishment, development and expansion of the information and communications industry.

This competition policy issue centers on the relationship between dominant/non-dominant access providers and dominant/non-dominant content providers. The Regulator has a role to play in the application of competition policy, including merger control.

4.2   Net neutrality

The question of whether action is needed to ensure unfettered access to the Internet is still being debated and challenged. The move to place restrictions on the owners of the networks that provide access to the Internet, to ensure equal access and non-discriminatory treatment, is referred to as "net neutrality." The US Congress is debating net neutrality and Verizon has challenged the Federal Communications Commission (FCC) rules on the matter in the U.S. Court of Appeal.

While there is no single accepted definition of "net neutrality," most agree that any such definition should include the general principles that owners of the networks that compose and provide access to the Internet should not control how consumers lawfully use that network, and they should not be able to discriminate against content provider access to that network.

The FCC, for example, has produced an Open Internet Order. A debate is going on as to whether more specific regulatory guidelines are required to protect the marketplace from potential abuses. Some argue that existing laws, regarding competitive behavior, are sufficient.

The ITU Trends in Telecommunications Reform 2013 Chapter 2 addresses a key question in the net neutrality debate and that concerns what type of traffic management is acceptable during peak time. What should not be acceptable is to restrict services which are seen to be competitive to those of the operator.

4.3   Licensing and Authorisations

In the early days of liberalisation the second generation Regulator focused on such matters as creating competition in different sectors through separate Licensing of such services as Mobile services, Fixed Services, Internet and international. The 3rd generation of regulation has moved to Unified Licences (UL) as set out in Government Policy e.g. Singapore, Australia, Nigeria, Kenya, Egypt and a number of EU countries. Technology advances in radio devices and the decision on the IMT spectrum has enabled different technologies to be used in the same frequency bands.

Such a UL should enable any company wishing to provide telecommunications services to do so using any technology and offering any type of services encapsulated under "telecommunications" i.e. fixed, mobile, data, and internet on a national or international basis. The unified licence would include many conditions including consumer protection, quality of service, coverage obligations, interconnection, anti-competitive behaviour and lawful interception.

In some countries there have been issues with the introduction of ULs, not of the principle but issues have concerned such matters as licence fees e.g. India or by incumbents attempting to delay competition e.g. Nepal. Never the less putting such issues aside and in support of creating sound and sustainable competition a technology neutral approach is required and the UL scheme allows for such an approach. An option is for the Regulator to have a General Authorization Scheme such as set out by OFCOM[39] where standard conditions are set out and published. This approach has been set out in the EU Authorisation of electronic communications networks and services Directive[40].

The main innovation is the replacement of individual Licences by general authorizations, while a special scheme for attributing frequencies and numbers continues to exist. According to this principle, the provision of electronic communications networks or services may only be subject to a general authorisation. In other words, the undertaking concerned may be required to submit a notification but it may not be required to obtain an explicit decision or any other administrative act by the national regulatory authority (NRA) before exercising the rights stemming from the authorisation. A clear distinction is made between the conditions applicable under the general authorisation and those linked to the rights to use radio frequencies and numbers. Consideration to a similar approach could be given to the production of broadcast content.

4.4   Interconnection

A time consuming and complex role of Regulators has been dealing with interconnection fixed termination rates (FTR) and mobile termination rates (MTR). Issues over interconnection have been a major tool in the armoury of established operators in slowing down the launch of services from a new entrant. Apart from transit operators, interconnection must not be seen as a source of profit but a reciprocal arrangement between licensed operators meeting their "any to any" requirements. However incorrect interconnection rates results in one operator to subside the services of the other when there is an imbalance of traffic.

Interconnection issues will continue to be a significant challenge to regulators. The Regulator has to have the appropriate powers to ensure interconnection rates reflect costs in order to support sustainable competition. With IP networks there is the opportunity to simplify interconnection rates using either "sender keeps all" or a single low rate based upon an IP efficient network. IP transnational interconnection enabling the world-wide internet connectivity is subject covered in Chapter 5 of the ITU Trends in Telecommunications Reform, 2013. With converged networks there is a progressive blurring of boundaries between the content and voice worlds.

4.5   Institutional efficiencies

Regulators need to be granted the appropriate regulatory powers and tools to fulfil their mandate efficiently and without undue political and market influence based on the principles of accountability, transparency, stability and predictability. If the Regulator is not working in a well written and clear legal framework the ability to work effectively is considerably impacted.

Like any organisation a regulator requires a clear vision and strong leadership. This is assisted if the Government also has established clear ICT Policy which the ICT Regulator is assisting implementation. One example is the Australian Communications and Media Authority (ACMA) whose chairman set a goal to be the 'world's best' converged regulator. The Australian Government established the clear ICT Policy lead which resulted in the converged regulator.

The Regulator has to be appropriately staffed to cope with a diverse set of services and dynamically changing market. Benefits can be derived from keeping the regulatory team as small as possible, staffed with very high

quality individuals, strong in their approach to solving problems and managing projects. Such individuals should be paid competitive remuneration with the ICT sector they are regulating. To maintain flexibility with varying work-loads, advances in technology and changes in public policy, they need effective processes to tender for and manage up to date specialist expert support. The experts required at any one time, will be dictated by the issue being addressed. Experts should not generally be asked to write reports but rather, prepare the draft text, i.e. be result driven. The result could, for example, be a regulation, regulatory decision, and guideline or consultation document. Such an approach radically reduces the fixed overhead of the regulator and enables the regulator to move with the times without the need for redundancies and without the need for a large capital base.

Traditionally different regulatory authorities' have been involved in regulating different aspects of what is now becoming the digital ecosystem covering such aspects as:

1. Promote and maintain fair competition.
2. Consumer Protection.
3. Spectrum management.
4. News media.
5. Advertising.
6. Telecommunications.
7. Television and radio broadcasting.
8. Information Rights
9. Postal services.
10. Utilities such as electricity and water.
11. Financial regulation.

Sector specific regulators, such as those dealing with Telecommunications, often find there is some overlap of roles with regulators dealing with non-sector specific issues such as consumer protection and competition. Many are able to resolve issues and sign memorandum of understanding, to assist in the division or responsibilities, and make clear to consumers and licensees who they should approach for different issues. With convergence of services is also coming an overlap of responsibilities between different sector specific regulators. However this is being overcome with a trend to converge regulators dealing with one or more sector of communications.

The role of the regulator in broadcasting is similar to some of the functions of the ICT regulator such as allocating and managing the radio spectrum, licensing service providers and ensuring universal access. But broadcasting regulators have additional duties regarding the social and cultural impact of the sector. They are also charged with overseeing content and ensuring diversity, protecting minors and the right of reply. Furthermore, if there is a Public Service Broadcaster (PSB), the regulator performs some form of oversight of it and private channels.

Convergence of services is driving regulatory requirements and oversight to converge. There has been a growing trend to bring together different regulatory bodies. The ITU define a converged regulator as covering some or all of these sectors: telecommunications, spectrum matters, Information technologies, broadcasting and in some instances, electronic content. The objective of such mergers generally is to increase efficiency of regulation and achievement of policy objectives. Increasingly there is a need for harmonization of regulation across different communications services in order to support efficiency, fairness and clarity for service providers and the general public. Such convergence should also assist in the cost reduction of regulation. Different countries have taken different positions concerning which authorities are merged.

The Australian Government reviewed the arguments for convergence of regulation. The Final report was issued In April 2012[41]. The report recommends that the Australian Communications and Media Authority (ACMA) be replaced with a new regulator. The report suggests that ACMA is not independent enough. However the news has been met with hostility from the industry, which has largely dismissed the findings and dubbed the report unnecessary. Certainly the subject stimulates debate, some of it based on vested interest in particular in the area of media. The Review concluded that there are three areas where regulatory intervention is justified: media ownership, media content standards, and Australian and local content.

The Communications Authority in Hong Kong (CA)[42] , China, was created in April 2012 and merged the broadcasting and telecommunication regulatory authorities. It is a unified regulatory body overseeing the converging telecommunications and broadcasting sectors. The Office of the Communications Authority (OFCA[43]) supports the Communications Authority in fulfilling its vision that Hong Kong, China, has the world-class communications services to meet the challenges of the information age.

The Korean Communications Commission [44] (KCC), in the Republic of Korea, is a converged regulator and has overseen one of the most impressive developments of a nationwide broadband networks. The Republic of Korea has ranked No. 1 among OECD countries for wireless broadband penetration rate since 2010. Korea Communications Commission has also established a Global Cyber Security Center supported by the World Bank. They argue that convergence has assisted them to accelerate economic and market development through reviewing and overseeing revised plans and regulations for:

1. promotion of convergence industries;
2. authorization of cross-ownership of diverse media;
3. reduced restrictions on broadcasting business ownership;
4. introduction of new business;
5. early facilitation of Internet multimedia TV(IPTV);
6. strengthening content in response to the era of multimedia and multichannel services;
7. switchover to digital broadcasting in full scale;
8. entering overseas broadcasting communications service market;
9. network advancement including Gigabit Internet service.

Some countries have chosen not to have a specific sector regulator but focus on competition aspects of all sectors. One example is the Commerce Commission[45] which is New Zealand's primary competition regulatory agency that includes a telecoms Commissioner responsible for telecoms matters.

In the Bahamas, the Public Utilities Commission and the Television Regulatory Authority were combined to oversee electronic communications (including broadcasting and cable TV). The Utilities Regulation and Competition Authority (URCA) further combines the role of a competition authority and a communications authority in a single authority.

Which industries can benefit from a merging of regulatory authorities will depend on the degree of potential substitution of services. It is clear that in the ICT industry broadband networks enables substitution of such communications services as: posts for email, fixed voice for mobile voice, Vsat TV for cable TV for broadband internet TV, broadcast TV for internet TV, radio broadcasting for internet radio and newspaper for news on internet web site. To a certain extent the arguments for sector specific regulators converging depends upon the market conditions such as: maturity of the market, broadband penetration enabling converged services, size of market and availability of expertise and degree of specialism required in any one sector. Whether the regulatory oversight of consumer protection and competition is managed separately from the ICT sector specific regulator is possibly less of a concern if effective dialogue and procedures are established.

4.6 Summary of duties

A useful summary of duties of ICT regulators is provided by the ITU, InfoDev ICT regulatory tool kit[46]. A more detailed example of the traditional roles of NRA (Box 5) is set out in the Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services ("Framework Directive[47]"). The "Framework Directive" forms part of the "Telecommunications Package" sets out the regulatory framework for telecommunications in order to make the electronic communications sector more competitive. This regulatory framework consists of this Directive plus four specific Directives dealing with the authorisation of electronic communications networks and services (the "Authorisation Directive"), access to, and interconnection of, electronic communications networks and associated facilities (the "Access Directive"), Directive universal service and users' rights relating to electronic communications networks and

services[48] (the "Universal Service Directive") and protection of individuals with regard to the processing of personal data and on the free movement of such data[49] (the "Privacy and Electronic Communications Directive"). Added to this list, there is also the Decision on a regulatory framework for radio spectrum policy (the "Radio Spectrum Decision"). To take account of the changing environment, at the time, the Framework Directive was amended in 2009, by the two Directives "Better law-making" and the "Citizens' rights". Regionalisation of regulation was further strengthened by Regulation (EC) No 1211/2009 of the European Parliament and of the Council of 25 November 2009 establishing the Body of European Regulators for Electronic Communications (BEREC[50]) and the Office.

The regional ICT framework set out by the EU is a good example. In response to the convergence of technologies and the need for horizontal regulation of all infrastructures, the EU framework is no longer limited to telecommunications networks and services but covers all electronic communications networks and services. This includes fixed-line voice telephony, mobile and broadband communications and cable, radio, terrestrial and satellite television. The content of services delivered over electronic communications networks, such as broadcasting content or financial services, is excluded, as is telecommunications terminal equipment to facilitate access for disabled users.

Box 5: EC Framework Directive

Member state Governments should ensure that National Regulatory Authorities (NRA) should:
1. Have independence from all organisations providing electronic communications networks, equipment or service. The NRAs, responsible for the ex-ante regulation of markets, must not accept instructions from any other body
10. Provide a right of appeal allowing any user or provider of electronic communications networks or services the right of appeal to an independent appeal body in the event of any disputes.
11. Demonstrate Impartiality and transparency in exercising their powers and ensure arrangements for public consultation of the interested parties before implementing measures which could have a significant impact on the market.
12. Consolidation of the internal market: The NRAs, the Commission and BEREC must cooperate to determine the instruments, as well as the most appropriate solutions, to deal with any situation which may arise within the internal market for electronic communications. In certain cases, the Commission has the power to refuse measures proposed by the NRAs.

NRAs should promote competition in the provision of electronic communications networks and services, through:
1. ensuring that users derive maximum benefit in terms of choice, price and quality;
2. encouraging efficient use and management of radio frequencies and numbering resources.

The NRAs must also contribute to development of the internal market, in particular, by:
1. encouraging the establishment and development of trans-European networks and the interoperability of pan-European services;
2. cooperating with each other and with the European Commission to ensure the development of consistent regulatory practice and application of the new regulatory framework for the telecommunications sector
3. NRAs must promote European public interests by:
4. ensuring that all citizens have access to a universal service, as specified in the "Universal Service Directive";
5. ensuring the availability of simple and inexpensive dispute resolution procedures;
6. contributing to ensuring a high level of protection of personal data and privacy (the "Privacy and Electronic Communications Directive").

Source: EU, europa legislation

Price regulation[51] is still one of the most common functions of regulators. However there is a trend to let competitive forces work and only have regulation concerning anti-competitive behaviour concerning such matters as abuse of dominance say in margin squeeze.

5 4th Generation Regulation

The role of the Regulator in the digital ecosystem and 4th Generation regulation is summarized in this section. The 4th Generation regulators role can be viewed as being driven out of necessity to focus on a number of critical areas arising out of the changing environment. There is a growing opinion that these areas are those depicted in Box 6. These are all focused around economic and social development and fulfilling Policy Objectives set out by Government and expressed in such documents as ICT Policy, Broadband Policy or a Digital Agenda. Let it not be misunderstood these areas of focus are on top of the more traditional function of a regulator which should progressively become less and less important with the maturing of a competitive market place.

Box 6: Evolving Role of Regulators

Source: Alan Horne
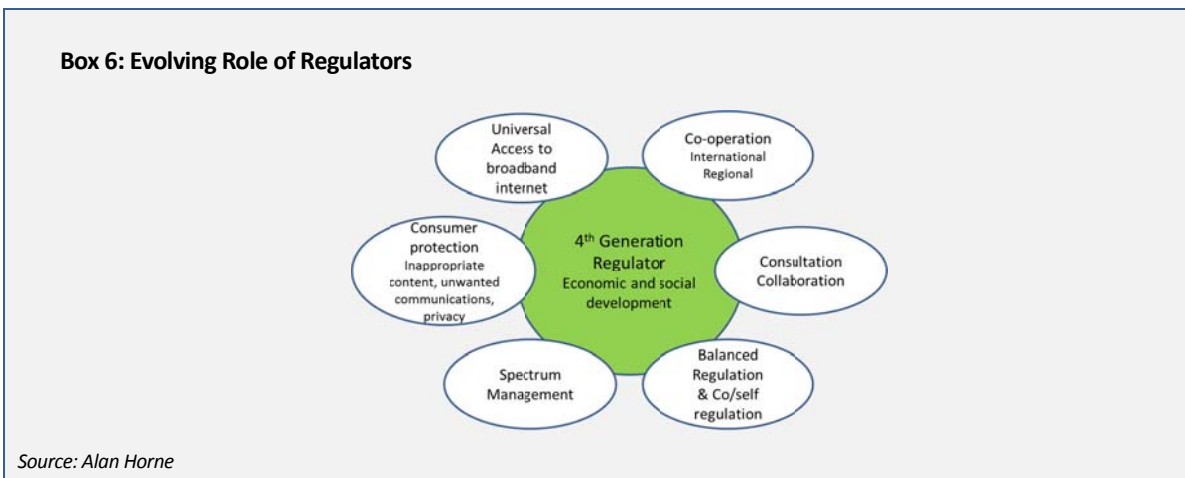
What will not change however is the fact that suppliers in a competitive environment will not willingly serve communities in uneconomic areas. Further in a highly competitive environment suppliers often focus on new customers and growing market share to satisfy their shareholders, rather than customer retention and pleasing their customers.

5.1   Universal Access to Broadband internet

The key challenge of all Regulators and Governments is to encourage the private sector to cover as large a percentage of the population as possible leaving only the smallest number of people requiring financial subsidy to be able to be connected. The 4th Generation regulator has a major role to play, working with a wide range of interest groups concerned ensuring that broadband connectivity to the internet is provided on a universal basis. In urban and developed countries this should be on a universal service basis. In rural communities in developing countries it is more likely to be on a universal access basis.

The ITU GSR 11 Best Practice Guideline covered regulatory approaches for advancing broadband networks[52]. These guidelines addressed encouraging innovation and extending digital literacy to enable digital inclusion of all in a broadband world. It covered funding mechanisms to foster public and private investment in broadband, investment incentives, coordination with stakeholders, other national entities involved and collaboration at the regional and international levels, stimulating innovation and development of applications and services and expanding Digital literacy.

The activities of the Regulator should be in addition to key activities of Government. Government and public services are generally the largest employer and largest spender on communication services. A sound ICT Policy and

mechanism to progressively have all public services provided over ICT and the digital ecosystem will provide a major boost to private sector investment. This assumes that public services will largely be run over public communications services and not using a government owned private network.

The regulator in Vanuatu took an innovative approach to investigate the provision of broadband internet and ICT services to a remote island community. Vanuatu has used the Universal Access Fund (UAF) in a broadband pilot project in a remote rural community.

Vanuatu Government has demonstrated leadership initially in liberalising the market and establishing a UA Policy and Fund. Key to success is having such policies addressing ICT and Broadband use and provision. Then there has to be an effective programme management involving representative of all stakeholders, an effective ICT Steering Committee, supported by Licensees exhibiting a sound Corporate Social Responsibility (CRS). Government has to show the lead in creating demand by budgeting for internet to be connected to every school and Health center. Generally an eGovernment strategy can bring considerable benefits with progressive development of applications to assist more effective government and more effective services. To fully roll out eGovernment requires that there is access to internet for all.

The Vanuatu Regulator worked with different Government departments to support delivery of better health and educations services. The Regulator concluded that in order to succeed in achieving "ICT for All" there has and will be a need for collaborative working but with major community involvement supported by demand driven incentives.

Vanuatu is an example of a Small Island development state (SIDS) which aims to overcome the hurdles of distance, low population density and low GDP through having a clear Policy; orchestrated strategic actions; coordinating demand; consolidating international traffic; strategic use of modern Satellite services; public private partnerships in submarine cables; stimulating demand and creating awareness of the benefits of being connected.

Governments recognise the importance of having all of its society connected by broadband communications and avoid a "digital divide". The competitive dynamics of the market has brought issues concerning the rollout of broadband communication networks in many countries. Licensees will not generally invest in rural communities if there is not a clear return on investment or they have signed a Licence obligation, received a financial subsidy or non financial incentive. Further Licensees have refused to invest in new fibre in urban areas if, as regulators have indicated, they will have to make them accessible to other operators.

Governments with Broadband and ICT Policies have developed various schemes to encourage the installation of new broadband infrastructure. The schemes can be categorized:

1. Licence based obligations.
2. Provision of grants on a competitive basis – evolution of the traditional Universal Access (UA) Schemes.
3. New broadband optical fibre based state run network.

Licensed obligations have been commonly used to ensure coverage of rural areas or percentage target for coverage of population for mobile operators. However it is not usual for ensuring broadband rollout. Universal service funds, where they exist, have also been focused on the provision of basic voice services.

The converged services are required by public policy to be accessible to all, to achieve digital inclusion and a fully functioning digital ecosystem. The 4th Generation Regulator will be involved with different funding mechanisms, licensing incentives, spectrum, and quality of service and infrastructure accessibility issues encouraging the investment and take up of ICT services over broadband networks.

Investment in infrastructure can be encouraged through policy and regulatory incentives. Incentives can be financial, such as the removal of Licence fees or taxation for a period, or could be non-financial such as allocation of additional spectrum upon achieving certain quality or coverage targets.

If a fund is established consideration should be given to reviewing the terms of the fund in order for it to be usefully used, so as not to create distortions in the market, but to assist the demand side for ICT services. Any funding subsidy needs to be spread amongst the widest of stakeholders as possible. In a developed nation this can by the Tax payer and Government can provide the subsidy. On the other hand in least developed countries (LDCs) where so often there is not an effective tax collection mechanism, subsidies must come from Development funds, Charities and the ICT sector as a whole. Subsidies can be applied to the "supply side", typical of most Universal Access Funds, or the demand side. Public policies must be developed that foster demand for innovation.

The OECD report on "Demand side innovative policies[53]" draws on country experience and case studies to illustrate the risks and opportunities for demand-side innovation policies. It highlights that a range of countries from Finland to Australia and emerging economies such as China and Brazil have used more targeted demand-side innovation policies such as public procurement, regulation, standards, consumer policies and user-led innovation initiatives, as well as "lead market" initiatives, to address market and system failures in areas in which social needs are pressing. The use of such policies is required where societal needs are not met by market mechanisms alone (e.g. health, environment) or in which private and public markets intersect (e.g. energy supply, transport and telecommunications). In developing such policies care has to be taken to avoid harming competition.

Supply-side economics is a school of macroeconomic that argues economic growth can be most effectively created by lowering barriers for people to produce (supply) goods and services, such as lowering income tax and capital gains tax rates, and by allowing greater flexibility by reducing regulation. According to supply-side economics, consumers will then benefit from a greater supply of goods and services at lower prices. Typical policy recommendations of supply-side economists are lower marginal tax rates and less regulation.[54]

Given the issues with private sector investment and use of supply side Universal Access Funds, there is an emerging trend for the state to become more interventionist in providing some telecommunications infrastructure. This is a reversal of the move towards total privatization of the sector.

In terms of Governments establishing separate publicly owned broadband networks Australia, for example, has established the Department of Broadband Communications and Digital Economy[55] (DBCDE) overseeing the development of the National Broadband Network (NBN). NBN is a next-generation broadband network designed for Australia's future needs. It aims to provide faster, more reliable broadband access to all Australian homes and businesses through a mix of three technologies: optic fibre, fixed wireless and next-generation satellite. DBCDE have set a target for 93 per cent of premises to have access to the NBN through optic fibre to the premises, capable of providing broadband speeds of up to one gigabit per second   The remaining 7 per cent of premises will have access to the NBN through next-generation fixed wireless and satellite technologies, providing peak speeds of up to 25 megabits per second. The government has established NBN Co Limited (NBN Co) to design, build and roll out the NBN. The NBN will be Australia's first national wholesale-only, open access, high-speed broadband network to sell wholesale services to service providers, such as internet or phone provider. In turn, service providers will offer retail services. More than 30 providers are reported to be delivering competitive services to customers over this open NBN.

The UK has taken a different approach. It functionally separated BT's access network to better enable it to act in a non-discriminatory way in the provision of wholesale services over its copper and optical network. Further the UK Government established an Urban Broadband Fund (UBF) managed by the Department for Culture Media and Sport (DCMS). The objective is to stimulate private sector investment to achieve a transformation in broadband in the UK by 2015. DCMS ran an Urban Broadband Fund Consultation[56] with potential suppliers which ended in March 2013 but no output has been issued at the time of writing this paper. The consultation provides information on commercial delivery models that could be adopted by city projects and sets the context of the funding and procurement options that may exist against them. This consultation process is being used to understand how the likely views and level of involvement of suppliers may be impacted by such factors as infrastructure access conditions, scope of commercial arrangements, approaches to procurement and funding. The UK Chancellor's Autumn Statement in December 2012 confirmed a further 12 cities will be allocated funding from the Urban Broadband Fund in addition to the ten cities that were announced in last year's Budget. The Department for Culture Media

and Sport (DCMS) anticipates that all of these cities will commence procurement during summer 2013. To be successful DCMS recognises the importance of communication with suppliers in each area who will provide the necessary capability to deploy infrastructure and sell services over it to the many businesses and residential customers who will benefit.

Regulators can incur difficulties, where Governments decide to have direct involvement in operation of infrastructure, if there is not clear separation in Government to avoid conflicts of interest between Policy making and operation. If such conflict occurs friction and poor decision making can result between the regulator and Government.

The Pacific Telecommunications Council has undertaken a Broadband study in Fiji: A Micro market Case Study[57]. This study has indicated that without government subsidization and financial incentives, rural service provision, mobile and fixed is not profitable for carriers. Yet, when rural coverage exists, the socio-economic benefit on rural communities is positive (Samuel et al. 2005). The local context of rural infrastructure also means issues like network maintenance and lack of electrical power. A maintenance strategy needs to be developed in tandem with the rural network deployment, such as a remote monitoring and maintenance station and provision for timely repairs (Egyedi and Mehos, 2012) Lessons from Fiji that are generally applicable are:

Societal:
1. Involve communities to build demand and ensure that services and needs are aligned (development of participatory practices and approaches).
2. ICT training and education at all levels of society to support usage, innovation and buy-in.
3. stakeholder representation and organization with external inputs and community development.

Institutional
4. Strengthening of independent non-governmental telecom/ICT regulators so stakeholders can be organized and plans implemented.
5. Development of consultation processes.
6. Development of mechanisms to effectively make use of skills and resources offered by external organizations.

Economic
7. Put resources to measuring (gathering statistical data) and assessing for greater certainty in policy development and growth assessments.
8. Target obvious sectors that need broadband and can support a national business model.

Technology
9. Pursue evolutionary introduction of technology and multiple broadband technologies – build in line with demand.

Both the Fiji and Vanuatu experience point to the need to involve the community and that community led initiatives and demand side stimulation is more likely to succeed than supply side initiatives. Further in order to be able to continue to fund the access to a remote community the services has to be taken up by the community. Funding connection just to a remote community health center, just to the school or just to a Tele-center is often found to fail after subsidies have ended. Connectivity to a remote community needs to be funded by total community activities in order to be sustainable. The key challenges to overcome include: Connectivity to rural, uneconomic areas, effective funding schemes, coordination of projects to support sustainability, community led, understanding of benefits, ICT industry support, training and Government led ICT Policy. Given that 56 percent of the worldwide emerging market population lives in rural areas (Egyedi and Mehos, 2012) the questions around bringing access to rural Fiji have, for example, general relevance.

Where Government is involved in service provision its oversight must be by a different part of Government from that which is making policy impacting telecommunications. Rather than engage in broad regulatory interven-

tion, the government's role in the provision of broadband should be based on sound economic principles limited to ensuring that markets function effectively and access is reasonably available to all.

Google in 2012 took a new approach and is installing optical fibre in Kansas City. It plans to challenge the existing cable operators. It is taking the approach to commit to installing fibre only after a critical mass has signed up to wishing to take up the services. Google has also announced plans to deliver broadband wireless services in Africa. Just monitoring the main social networks indicates the sweeping plans and activities of Google in lying fibre in urban USA, in wireless services in rural Africa alongside its social networking and delivery services such as entertainment TV. Google has a USD 43 Billion cash reserve to draw on.

It is early days yet but if Google follows a new model and provides free access, cross subsidizing access from other services, this could challenge the approach taken by the Regulator, concerning potential anti-competitive behaviour.

5.2 Consumer Protection

Consumer complaints have, and will remain a major area for any regulator. To support market entry and fair competition newly formed regulators have had to work hard to ensure networks are interconnected and that the incumbent operator does not abuse its dominant position. Many new entrants have focused on competing and growing their customer base. After acquiring customers customer service has not always been as effective as might be expected and the regulator has found it has had to deal with many consumer complaints.

With convergence of services and the increased use of the internet, especially by mobile devices, consumer protection activities are even more important than ever before. Many countries are adopting consumer protection regulations specifically designed for ICT customers, which are enforced by the ICT regulator and/or a designated consumer protection agency. The Australian Communications and Media Authority (ACMA) has instituted measures to protects consumers' interests in the Internet Age by investigating complaints about online content and gambling services; encouraging the development of codes of practice for ISPs; and educating the public about Internet safety and privacy risks, particularly for children.

Consumer association and panels have been established in various countries focusing on communication issues, notably the Ofcom Consumer Panel[58] and the UK Communications Managers Association[59] (CMA). Further examples can be found in Bahrain and Vanuatu where the Regulators have established Consumer and Business Advisory Groups. In many countries there are other organizations that promote consumer protection including government organizations and self-regulating business organizations such as consumer protection agencies.

ICT Regulators should work in collaboration with any separate agencies in order to coordinate activities in the interest of consumers. Further, Regulators need to ensure that operators make it clear to their customers that there are independent regulatory entities which they can refer to if they are not happy with the service they are receiving or if they have concerns with the content of the communication. It has to be made clear to customers which regulatory entity to contact according to the type of issue of concern. For example if a customer is concerned over a mobile finance services or mMoney then the complaint most likely should be referred to the financial regulator which is most likely the Reserve Bank. Prior to setting out advice as to whom to contact the ICT Regulator will have to agree with the other respective regulators over the division of work. This should generally be documented in a Memorandum of Understanding (MOU).

There are also online initiatives supported by consumers such as Consumer Tadka run by Akosha an online consumer forum, in India. The objective of Consumer Tadka is to assist consumers resolve disputes by registering their complaint online on their website[60]. One of their executives calls a customer who has registered a complaint and assists them to solve their issue. They have prepared a "Filing a consumer complaint – the no-nonsense guide[61] "

A consumer complaints survey was conducted by Consumer Tadka[62] in 2011. The results of the survey are set out in Box 7. The results are not a good reflection on the operators even though customer satisfaction is an

important "metric" being tracked by senior executives of most telecom companies. These results could be found to be typical in most counties in the world.

Regulators have to ensure that they build a strong relationship with consumer groups such as Akosha as well as ensure consumers are fully aware of who to refer to in the event they have a complaint. The Regulator, in knowing the key areas of concern for consumers should work with Licensees to ensure that the areas of concern are properly addressed so that in time there are fewer consumer complaints and hopefully a happier customer.

The Regulator can learn from surveys and feedback results into their actions. Any regulations should ensure operators are providing the appropriate consumer complaint escalation procedures. Where regulations have been introduced, for example concerning "do not disturb" (DND), yet there are still significant complaints then it may be an awareness campaign is required on the DND facility.

Box 7: Results of consumer survey of complaints by Indian consumers

Tadka survey concluded that consumer disputes are usually about one of the following issues:
1. **Fraudulent Fair Use Policy** one example was claims that one operator's meters are "deliberately" faulty.
2. **Overcharging/non-activation of plans**, activation of wrong plans e.g. GPRS. One customer was able to get extra GPRS charges removed by negotiating hard with one of the mobile operators.
3. **Charging for VAS products** – many times certain VAS services (like caller tunes, mobile content) are automatically activated and charged from customers' accounts.
4. **Wrong billing** – though the billing systems are automated, sometimes the bills are obviously wrong e.g. charges for the same calls twice.
5. **Bad network coverage/call or broadband quality/dropped calls** – a really rampant issue.
6. **Getting calls and SMSs despite DND activation** – National Do Not Disturb (DND) Registry has mostly worked, but sometimes customers keep getting messages. Claims have been that operators give out their mobile numbers and their numbers are abused by businesses other than the telecom company.
7. **Miscellaneous** – like recharges not getting credited in time and rude behavior by customer care personnel.

Consumer Tadka summarise that there are several key problems:
1. The telecom industry has such high churn rate with new customers signing up each day and current customers deactivating their accounts, that an individual customer does not seem to matter in the larger scheme of things;
2. The financial amount involved in most consumer complaints is so small that it doesn't make sense for most customers to take action – like finding a lawyer and filing a complaint.
3. The three tier self-regulatory system set up by telecom companies – customer care, nodal officers, and appellate authority's take a lot of time for the customers and is expensive for the telecom companies.

Source: Tadka

Along with the benefits of access to the internet comes the negative side. Given the very nature of the internet and its openness and accessibility then some of the less desirable factions of society use the internet in an attempt to defraud others or lure others to take actions which are not necessarily in their best interests.

Society attempts to protect children and the vulnerable through general laws. In respect to content then there are an increasing number of content control software (see Australia's Broadband comparison site for one definition[63]). In terms of Internet web filtering software, a protection filter controls permission levels of what a

reader/viewer is able to read and see on the Internet. The software is typically installed on a home computer which has customized settings to suit filtering levels. The software can also be in the cloud say at the customer's Internet Provider. Common features include blocking specific website access, logging/monitoring actions, and image filtering that can be set over a large range of categories. Most popular content control software is very easy to install and operate which makes it very user friendly.

The involvement of Governments and Regulators in any matters concerning content control is sensitive and triggers the freedom of speech activists. The UK Government, for example, has supported consumers by providing information and advice on their web safe internet[64] web site.

Regulators are working in cooperation with such groups as Family Online Safety Institute (FOSI[65]). The Family Online Safety Institute is an international, non-profit organization which works to make the online world safer for kids and their families. One example of FOSI working with a regulator is in Bahrain where a regional conference[66] was held involving regulators from the Arab Region, FOSI and many different stakeholders drawn from education and the consumer association.

Governments and Regulators have worked together in the development of legislation such as The Children's Internet Protection Act[67] (CIPA), which was enacted by the US Congress in 2000, to address concerns about children's access to obscene or harmful content over the Internet. CIPA imposes certain requirements on schools or libraries that receive discounts for Internet access or internal connections through the E-rate program – a program that makes certain communications services and products more affordable for eligible schools and libraries. In early 2001, the FCC issued rules implementing CIPA and provided updates to those rules in 2011.

Over a third of young people have come into contact with online content that upsets or worries them, according to a report released to mark the UK Safer Internet Day 2013. 27% of 7-11s and 41% of 11-19s have seen something online in the past 12 months that they found hurtful or unpleasant. Examples included scary videos, pictures and chainmail, 'rude' things and swearing, violent films or games. The survey also found that 31% of 7-11s and 23% of 11-19s cited gossip or mean comments being shared online as something that stopped them enjoying their time online.

The explosion in content provision is a huge challenge to content regulation (how does the regulator screen everything?), which is made even more difficult because a large proportion of the content may originate in other jurisdictions. The most practical way forward, for Regulators, is possibly the encouragement of providers to develop self and co-regulations in dealing with complaints from customers, and after a particular threshold block or remove offensive material. The provision of customer controlled filters, either in the network or in the customer's PC, together with education on parental controls, remains a pragmatic approach.

The concern of individuals over the privacy of their communications has been in existence since the first telephone call was made by Bell in 1876. In the digital ecosystem[68] where everything and everyone is connected, privacy of individual and corporate information is even more critical. To protect privacy of information systems and processes are constantly being developed to keep ahead of the criminals. Data protection Laws abound but when a criminal is off shore then issues arise with prosecution even if the perpetrator is identified[69]. The GSR12 Best Practice Guidelines addressed regulatory approaches to foster access to digital opportunities through cloud services[70].

The World Intellectual Property Association[71] (WIPA) has indicated that the ICT sector now incurs the biggest number of disputes. Copyright infringement facilitated by broadband service is increasingly drawing regulators into the middle of the copyright debate, particularly in the area of enforcement and Internet intermediary liability. ICT regulators are increasingly being viewed as the appropriate authority to implement rules that protect copyright, provide protection for consumers and encourage investment and service innovation within the digital economy. The development of a competitive environment and the costs of services are being impacted by the growing number and costs of litigation.

5.3   Spectrum Management

The ITU highlighted the importance of allocation of spectrum in an effective manner in order to meet the growing demands for more and more spectrum[72].

The objective of maximizing revenues to the treasury, from such scarce resources as spectrum or public owned shares in the incumbent operator, through raising short term substantial monies, has tended to be replaced by a longer, more strategic approach. Governments are increasingly aware that allowing the private sector to invest in ICT networks and the consequential take up of ICT services, positively impacts growth in GDP. Taxation revenues such as income tax, value added tax and profit tax should outweigh any short term gains from an auction designed to maximise revenues say for a mobile Licence or spectrum.

The approach Governments and regulators take to allocation and assigning spectrum to satisfy the growing demand for broadband communications, has a direct impact on competition, costs and a rollout speed. The issues in developed countries with high population densities and high GDP is more severe than in less developed countries and less populated regions.

Spectrum should be allocated to maximise the best economic and social use. Where there is competition for the spectrum then auctions should be designed so as to achieve an optimal economic and social outcome. Operators should be encouraged to drive for efficiency and maximise quality.

Consideration needs to be given to the 4th Generation Regulator wholesaling spectrum, in effect charging a rent for its use and not necessitating operators to lay out considerable capital expenditure to buy the right to use spectrum i.e. move spectrum from a CapEx to a OpEx and off the balance sheet. Capital needs to be reserved for infrastructure investment. Such a move would financially assist operators and enable them to rollout new infrastructure and even provide lower cost services to the consumer. If operators are not effectively using the spectrum then they would lose the right to use.

Often there has been a separate body in each country managing the spectrum allocation, assignment and monitoring. Competition has developed for spectrum with the commercial sector pushing the military to release spectrum allocated to military and security systems. The converged regulator, with the appropriate mandate under law, can fill an important coordinating role between the commercial and non-commercial sectors. Where there are separate entities managing spectrum there can arise issues over effective working. The telecommunications regulator has to work at a pace to match commercial realities. An agency within a Ministry, especially if it is linked to the military, may not readily support the reallocation of spectrum and can sometimes be politically influenced.

With the rapid growth in penetration of mobile services, often driven by regulatory requirements on coverage, has come the demand for ever increasing spectrum bandwidth. Pressure has been put on other sectors such as broadcasting where analogue systems have inefficiently used scarce spectrum. Digitisation of TV transmissions have pushed the conversion from analogue to digital TV and Radio releasing new spectrum for mobile services (The Digital Dividend[73]).

It could be argued that there has been an over emphasis of the importance of bandwidth and speed rather than a focus on quality of transmission. Overall it is not about speed of bits and bytes but availability of services, access to all and maximising the speed of effective information exchange. If a network is not optimally designed then there are errors and retransmissions. These slow down the overall effective rate of useful data.

Ofcom's recent 4G spectrum auction is an example of an attempted to balance the differing interests in the 800 MHz and 2100 MHz spectrum for the provision of broadband services available for indoor and outdoor use in rural and urban areas. Ofcom attached rollout requirements to the spectrum to support their social goal of broadband connectivity to all.

5.4   Cooperation

Regulators have a key role to play in coordinating with law enforcement agencies in protecting privacy of infor-mation or indeed enabling lawful interception or tracing. This is a subject where further international legislation is under consideration.

In the converged world working over the digital ecosystem everything and everyone is interconnected in one way or another. To enable such a system to function standards and operational procedures are required. Further a commonality of approach is required by regulators. There needs to be forums where communities of interest can work together at a local, national, regional and international level. The 4th generation, ICT regulator can play a key facilitating role in such forums.

For criminal activities each country has its own legislation and enforcement agencies. The internet means that criminal or less than desirable activities can be initiated in another legal jurisdiction. International agreements do attempt to assist but are not necessarily as effective as authorities might wish. On line crime includes such activities as Hacking, Viruses, Pirating, Illegal Trading, Fraud, Scams, Money Laundering, Prescription Drugs, Defamatory Libel, Cyber Stalking and Cyber Terrorism. The Regulator has an important role to play in working with International crime prevention agencies in establishing the appropriate international legislation and co-operation to tackle criminal activities over the internet.

With the growth in ICT products so is there a growth in eWaste. Regulators should collaborate with environ-mental agencies in this important issue and where necessary support operators and consumers work within the environmental legislation.

Each country can benefit by learning from other countries and other Regulators in setting their policies and institutional structures. To assist in capacity building and exchange of information and experiences, Regional Regulator Groups have been formed. The Telecommunication Development Bureau (BDT) of the ITU established and run an annual Global Symposium for Regulators (GSR)[74]. The first GSR was held in 2000 in Geneva. It was the first time ITU organized an event just for national communications regulators and policy-makers interested in establishing a regulatory body. There were 14 regulatory bodies in 1990, 86 in 1998, 124 in 2002. As of mid 2013 there were 161 countries with separate Regulators.

There are benefits to be derived from cooperation between regulators. Box 8 lists selected regional regulator groups and some of the current topics they are addressing.

Box 8: Selected Regional Regulator Groups – current activities

Regulator Group	Members	Key Issues being addressed
Arab Regulators Network (AREGNET)	22 Arab Countries	The main objectives of AREGNET are to share exper-tise, know-how, and success stories between Arab countries, discuss possible regulatory challenges, and finally attempt to approximate Arab telecom regulatory frameworks whenever possible. Current issues being addressed include: Customer protection across borders: National Broadband plans, CERT Working Group and Cross-border type approval certificates
Association of Communications and Telecommunications Regulators of Portu-guese speaking States from the Community of Portuguese Speaking	National Regula-tory Authorities (NRA) for communications and telecommunica-tions of 14 Portuguese speaking countries.	Pros and cons of regulatory aspects concerning roam-ing and international communications prices

Countries (ARCTEL-CPLP)[75]		
Association of Regulators for Information and Communication Services of Eastern and Southern Africa (ARICEA[76])	The membership is open for all ICT regulators in the COMESA region. Currently there are 10 members covering Communications and Utilities.	Strategic issues in the communications sector that promote growth and regional integration. Key issues are consumer protection, cyber-security and quality of service.
Body of European Regulators (BEREC)	Regulatory bodies within the member of the European Union	The Annual Work Programme[77] indicates that key priorities are to promote regulatory approaches and practices, which enhance competition and provide the right incentives for investment in new (fixed and mobile) high-speed networks. Recent activities have included commenting on the Draft EU Universal Service Directive and Producing Guidelines on Roaming Regulations.
Communication Regulators Association of Southern Africa (CRASA)[78]	Consultative body of 12 regulators dealing in telecommunications, broadcasting and postal sectors drawn from South African Countries.	Facilitate harmonisation of ICT and Postal policy and regulatory frameworks in SADC. Individual information, communications and postal markets, in the region, were not big enough to have comparative advantage on the global arena as well as attract adequate investment to build modern infrastructure for provision of universally-accessed ICTs and Postal services. Market integration was, therefore, identified as the solution to the challenge. Key topics covered include Policy, Interconnection, spectrum management and harmonization of frequencies.
REGULATEL [79]	Telecommunications regulators from 18 Latin American Countries	Financing broadband communications. Harmonization of regulations.
South Asian Telecommunications Regulators' Council (SATRC)	Regulators from 9 South Asian Countries	ICT Policy, development of regulations and spectrum
West Africa Telecommunications Regulators' Association (WATRA)[80]	15 NRA in West Africa	Actions to foster liberalization and competition through the establishment of modern legal and regulatory structures for telecommunication delivery in West Africa towards a common, virile common Telecommunications market. Recent activities include pressure to reduce Mobile tariffs and harmonization of regulatory identity to boost investment and investor-confidence.

Source: Alan Horne

In the more recently liberalised markets policy makers and the newly formed regulators have been able to take advantage of the significant body of experience and regulatory instruments available from other countries which have been through the process of liberalisation.

The arguments for cooperation between regulators are high and can bring substantive benefits through sharing best practice. There are arguments for centralising some of the regulatory activities in regions which have very strong common goals and legislation focus mainly around efficiency in production of common policies, guidelines

and regulations. Due to variation of local market condition the implementation of regulation could be argued as best being on a local or national level.

Further there are other forums where Regulators can participate to improve their understanding in regulating the digital ecosystem. A DE Community's website has been created under an initiative of the World Economic Forum. The DE community website[81] was created and as a neutral collaborative platform intended to encourage dialogue and discussion and to provide a better understanding of the future of the digital ecosystem. The fundamental building block of the growing digital ecosystem is modern ICTs.

5.5 Consultations

Regulators have traditionally had a requirement to consult with stakeholders before issuing such documents as regulations, decisions, determinations and Guidelines.

With convergence of services and the significant growth in the use of the internet the number of parties involved has increased. For example in working with stakeholders on co-regulatory measure concerning content then the stakeholders may include Consumer groups, religious leaders, educationalists, content developers and programme makers as well as network operators.

Engaging with community leaders and involving them in the consultation processes, is essential particularly in developing communities. Communities have to be progressively aware of not only the opportunities that broadband internet brings but on the issues that need to be addressed by some form of regulation or simply education and awareness.

Regulators have and always will have a close working relationship with Government. Advising on and implementing Government Policy are key roles for Regulators. Regulators may work with Government in managing public consultations concerning ICT policy. For example the US developed the National Broadband Plan[82] after extensive consultation. FCC acted as the enabler and started the process of creating this plan with a Notice of Inquiry in April 2009. Thirty-six public workshops held at the FCC and streamed online, which drew more than 10,000 in-person or online attendees, provided the framework for the ideas contained within the plan. These ideas were then refined based on replies to 31 public notices, which generated some 23,000 comments totaling about 74,000 pages from more than 700 parties. The FCC also received about 1,100 ex parte filings totaling some 13,000 pages and nine public hearings were held throughout the country to further clarify the issues addressed in the plan. The FCC also engaged in significant collaboration and conversations with other government agencies and Congress, since the scope of the plan included many issues outside of the FCC's traditional expertise.

Having an open communications channel with operators is important. With the growing complexity of the market and the issues being addressed formal, and when appropriate informal, communications can assist resolving issues. The consultation process is essential not only with operators but all stakeholders involved in the digital ecosystem, in particular consumers. A rigorous consultation process will assist the 4th Generation Regulator take actions, which better achieve assisting in economic and social development and at the same time, assist in minimizing disputes and costly challenges.

5.6 Balanced Regulation

The approach taken to regulations has to reflect the changing environment. The Regulator should rely on Primary Legislation producing regulations, backed up by law, only where necessary and where if they are not adhered to, then penalties may be imposed.

The regulator should work with Licensees to either encourage them to develop Guidelines on behaviour, or develop such guidelines in cooperation. This is generally referred to as self-regulation or co-regulation. With self-regulation industry voluntarily develops, administers and enforces its own solution to address a particular issue with

no formal oversight by the regulator or legal enforcement. In reality what is more common is co-regulation where the regulator and industry develop, administer and enforce a solution. Such co-regulation will include arrangements accompanied by a legislative backstop. The industry administers its own arrangements but government provides legislative backing to enable the arrangements to be enforced by the regulator.

Experience and guidelines on when to use self and co – regulation can be found on the web pages of ACMA[83] and OFCOM[84]. By way of example OFCOM commissioned an independent survey of the UK code of practice for the self-regulation of new forms of content on mobiles. OFCOM concluded[85] that the Code is effective in restricting young people's access to inappropriate content and a good example of industry self-regulation.

In order to be effective the 4th Generation regulator needs to exhibit such characteristics as: openness to ideas and approaches encouraging investment; flexibility to keep up with the rapid changes in the market; business acrimony, to work with operators, in the knowledge of financial aspects of the business; political agility and understanding to work with the ever changing politicians and supporting their understanding of the industry; ability to advice in the development of policies; ability to develop appropriate regulations to implement public policy; consumer orientated to assist their understanding of the services and approach to be taken in resolving issues.

At times a regulator has to be innovative, working to achieve the vision and goals set by Policy but remaining within the law. By way of example, the regulator in Bahrain took an innovative approach to number portability through taking on the capital costs of the number portability system. This approach removed the burden from the operators and enabled an effective implementation enabling customer to change provider and keep their existing number.

Regulators have the difficult task to balance where ex ante regulation can be relaxed or withdrawn, co and self-regulation can be used with protecting the interests of consumers against an effective fixed voice monopoly, control fair competition between two mobile suppliers, and try to extend the availability of services in remote rural areas.

5.7   Best practice

Based on experience in developed and developing markets a 4th generation Regulator is envisaged to exhibit the following characteristics:

1. implementing pro-competitive ICT policies which are influenced by international and regional agreements and directives to achieve social and economic objectives;
2. regulating a converged communications environment, either by a single converged regulatory entity or a closely coupled group of regulators, effectively regulating competitive broadband communications services (Telecommunications, internet, radio spectrum, access to land, naming and numbering, TV, Radio and Posts);
3. taking action, within the scope of ICT regulation, to support the protection of public interests such as health, safety, the environment, and social cohesion;
4. playing a key coordinating role in consumer protection and building trust of consumers in the content and security of information;
5. having established processes and procedures to work in a collaborative and formal way with a wide range of national, regional and international stakeholders involved with developing and sharing approach to market development and regulation;
6. working with or managing Government led funding and private initiatives to secure universal services for broadband internet connectivity and achieving Digital inclusion fostering Community led initiatives;
7. working in and supporting a sustainable developed highly competitive and largely digital environment being innovative where appropriate;

Further based upon experience a number of key success factors which need to exist in order for a competitive market to work effectively are set out in Box 9.

Box 9: Key success factors for a sustainable and effective competitive market

1. Clear Government Policies which set high level goals for the sector and which have been developed through public consultation. Such polices should aim to support:
   a. capitalizing on the value of public infrastructure and scarce resources;
   b. encouraging use of ICT services for social and economic activities;
   c. encouraging services to be available to anyone anywhere;
   d. encouraging prices to fall to an efficient level;
   e. creating a vibrant competitive market giving the consumer choice;
   f. preventing abuse of power by dominant providers;
   g. protecting consumers' personal information and privacy;
   h. ensuring any to any connectivity - interoperability[86];
   i. making it easy for consumers to change providers;
   j. ensuring availability of spectrum, numbering, addresses and land on fair and equitable terms;
   k. technology neutrality;
   l. encouraging investment.
2. Regulation to move from ex ante to ex post.
3. Ensuring disputes can be dealt with effectively.
4. Laws which are as concise as possible.
5. Clear separation of those responsible for setting policy, regulation and operation so as to avoid conflicts of interest.
6. Government Ministers who understand the current Policies, Laws and working of Institutions before changes are proposed.
7. Providers of regulated services who are prepared to work within their Licence conditions and regulations and follow protocol competing fairly but energetically.
8. A financially separate entity regulating the sector with income coming directly from the sector it is regulating, with competitive employment terms and remuneration.
9. A regulator who consults before preparing any guideline, regulation or decision.
10. Work with guidelines or co-regulation and introduce regulations only when absolutely required to support consumer protection and sustainable competitive services.
11. Capable staff within the regulator who are knowledgeable about the big picture, adaptable and effective programme managers.
12. A regulator with effective processes and procedures to manage the tendering for expert support tuned to the changes as the market develops.
13. An ex incumbent who is free to operate financial and staff policies and not constrained by historic monopoly or ministry practices.
14. Financial incentives to encourage private sector investment which are stable and do not change without consultation and align with investment planning cycles.
15. Mechanisms to finance un-served or underserved communities and geographical areas.
16. A clear set of regulatory guidelines covering key areas such as anti-competitive actions, consumer protection, spectrum management, licensing, quality of services, content, interconnection and infrastructure sharing.
17. Adoption of international standards;
18. An appeals process enabling licensees to resolve any disputes with each other, consumers or the regulator which is low cost and quick process.
19. An educated consumer understanding the choice and taking steps to ensure they understand the terms and conditions of the services being purchased.

Source: Alan Horne

OFCOM, amongst others, can be viewed as having the character of 4th Generation regulator. By way of example Ofcom's priority actions are set out in its 2013/2014 plan[87] which is highly reflective of a regulator in a digital economy (Box 10).

Box 10: Ofcom's priorities for 2013/2014

1. **Promote effective competition and informed choice.** This will include ensuring effective competition and investment in both current and superfast broadband, and promoting choice for consumers through clear information and efficient switching processes.
2. **Secure optimal use of spectrum.** Ofcom will support the future release of more spectrum for mobile broadband, to meet consumers' growing demand for data.
3. **Promote opportunities to participate.** For consumers and citizens to benefit from communications services, they need to be able to access and make use of them. Ofcom's work in this area will include securing the universal postal service and working in collaboration with Government and industry on the availability of superfast broadband.
4. **Protect consumers from harm.** Ofcom will develop and enforce consumer protection policy on a range of issues. This will include reforming non-geographic telephone numbering to ensure price transparency and considering issues such as mid-contract price increases in mobile phone contracts.
5. **Maintain audience confidence in broadcast content.** This will involve relicensing the commercial public service broadcasters to ensure continued delivery of high quality, widely available public service channels

Source: Ofcom's Annual Plan for 2013/2014

Similarly the Korean Communications Commission can also be viewed as a 4th Generation Regulator. Box 11 sets out their Vision and 2013 key issues.

Box 11: Korea Communications Commission (KCC) Vision and key issues – 2013

Vision
1. **Promotion Convergence Industry:** Authorization of cross-Ownership of Diverse Media, Reduced Restrictions on Broadcasting Business Ownership, Introduction of New Business.
2. **Vitality in the Content Business:** Formation of an Environment Where the Value of Content is Recognized, Formation of a Foundation for Production and Distribution of Broadcasting and Communications Content.

Key Issues
1. **Visibility of Development:** Early facilitation of Internet Multimedia TV (IPTV), Strengthened contents in response to the era of multimedia and multichannel, Switchover to digital broadcasting in full scale, Network advancement including Gigabit Internet service.
2. **The Market-friendly Regulatory Reform:** Restrictions on the ownership in Satellite broadcasting and terrestrial DMB to be eased, Deregulations on broadcasting commercials and introduction of Media Representatives, Improvement of entry into telecommunications market and pricing regulations, New mid and long term policy direction to be offered.
3. **User Protection and care for poor:** Investigation, restraint and correction on the use of personal information, More stringent measures to deal with harmful information on the internet, Constant measures to cut telecommunications service fees for households, More access to the service to be provided for the service marginalized including the disabled and foreigners.

Source: KCC

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Mauritius is a good example of economy which has experienced a significant growth supported by a vibrant ICT sector. The Government set out its ICT vision and established a national ICT Authority (ICTA). ICTA can also be viewed as being a potential best practice example. Mauritius chose to form an Information and Communication Technologies Authority[88] (ICTA) Act in late 2001. Its vision is "to play a leading role in the future of ICT in Mauritius contributing to an efficient, competitive and optimally regulated ICT sector." The ICTA Mission is "To promote affordable and adequate access to quality ICT services through functional market-driven competition and regulatory principles in a trouble-free Networked Information and Knowledge Society." In recognition of regional leadership, the ICTA was awarded Best Regulator for the Southern and Eastern Africa by Africa by Africa Telecom People (ATP).in October 2012[89] .

Nepal's Wireless Broadband Master Plan[90] released in October 2012 is also a good example of a plan which is focusing on social and economic principles.

In terms of a Regional entity for Regulators the Vision set out for BEREC could be viewed as best practice (Box 12)

Box 12: Body of European Regulators – Vision

Committed to independent, consistent, high-quality regulation of electronic communications markets for the benefit of Europe and its citizens.

BEREC contributes to the development and better functioning of the internal market for electronic communications networks and services. It does so, by aiming to ensure a consistent application of the EU regulatory framework and by aiming to promote an effective internal market in telecoms sector, in order to bring even greater benefits to consumers and businesses alike. Furthermore, BEREC assists the Commission and the national regulatory authorities (NRAs) in implementing the EU regulatory framework for electronic communications, to give advice on request and on its own initiative to the European institutions and to complement at European level the regulatory tasks performed at national level by the regulatory authorities. NRAs and the Commission have to take utmost account of any opinion, recommendation, guidelines, advice or regulatory best practice adopted by BEREC.

In particular BEREC is requested to:
- develop and disseminate among NRAs regulatory best practices, such as common approaches, methodologies or guidelines on the implementation of the EU regulatory framework;
- on request, provide assistance to NRAs on regulatory issues;
- deliver opinions on the draft decisions, recommendations and guidelines of the Commission as specified in the regulatory framework;
- issue reports and provide advice, upon a reasoned request of the Commission or on its own initiative, and deliver opinions to the European Parliament and the Council, when needed, on any matter within its competence;
- on request, assist the European Parliament, the Council, the Commission and the NRAs in relations, discussions and exchanges of views with third parties; and assist the Commission and NRAs in the dissemination of regulatory best practices to third parties.

BEREC's main tasks include to:
- participate in consultations under the single market consultation (Article 7) procedure;
- give opinions on cross-border disputes;
- disseminate best practices, assist NRAs, advise the Commission, the European Parliament and the Council, and assist the institutions and the NRAs in their relations with third parties;
- deliver opinions on draft recommendations and/or guidelines on the form, content and level of detail to be given in notifications, in accordance with Article 7b of Directive 2002/21/EC (Framework Directive);

- be consulted on draft recommendations on relevant product and service markets, in accordance with Article 15 of the Framework Directive;
- deliver opinions on draft decisions on the identification of transnational markets, in accordance with Article 15 of the Framework Directive;
- be consulted on draft measures relating to effective access to the emergency call number 112;
- be consulted on draft measures relating to the effective implementation of the 116 numbering range;
- deliver opinions on draft decisions and recommendations on harmonisation, in accordance with Article 19 of the Framework Directive;
- deliver opinions aiming to ensure the development of common rules and requirements for providers of cross-border business services.

Source: BEREC

The ITU GSR has prepared a series of Best Practice Guidelines, the 2013 guidelines focus on the evolving roles of both regulation and the regulators in a digital environment[91]. This series commenced in 2003and have changed with the development of the market.

The International Chamber of Commerce (ICC) business guide to telecommunication liberalization[92] draws on a range of case studies from the past two decades highlights the adverse effects of discriminatory taxes on telecommunications services[93]. It attempts to encourage public policy to focus towards incentives for the private sector to invest in telecommunications and ICT infrastructure rather than over tax it.

6 Conclusion

This paper set out to address a series of questions: In this growing digital ecosystem how does the regulator address such matters as regulating individuals, businesses and "things", move to 4th generation regulation, a new model of regulation based on consultation and partnership? How should the regulator balance efficiency, fairness and cost-saving to prepare for the digital cloud ecosystem? What approach should the regulator take in developing appropriate regulatory incentives, foster co-regulation, promoting regulatory incentives in addition to competitive measures such as smart allocation of spectrum for IMT (3G, LTE) AND finally is it enough just to have cooperation among regulators?

In summary the digital ecosystem is evolving with new developments covering, technological, network convergence, growth in internet services and financial transactions, social networking and the competitive supply of services delivered over broadband networks. However, connecting everyone and everything with broadband internet provides the less savory side of human nature with new opportunities to exploit others.

Governments have recognised the importance, to social and economic development, of competitive universal access of broadband services and are reflecting these in National Polices which the Regulator has a responsibility to implement. Further National Policies are being shaped by international trends, international and regional agreements and directives. The challenge Governments are facing, in developed and developing countries, in managing limited resources in tackling social and economic issues, cannot be underestimated. The 4th generation Regulator can support Governments tackle these challenges through effective regulation of the digital ecosystem. A 4th Generation regulator's role can be viewed as being driven out of necessity to focus on a number of critical areas arising out of the changing environment. There is a growing opinion that these areas focus around economic and social development and fulfilling Policy Objectives set out by Government and expressed in such documents as ICT Policy, Broadband Policy or a Digital Agenda. Let it not be misunderstood these areas of focus are on top of the more traditional function of a regulator which should progressively become less important with the maturing of a competitive market place. 4th generation regulations have to implement National Policies, effectively regulating competitive broadband telecommunications, internet, radio spectrum, access to land, naming and numbering, TV, Radio and potentially Postal services.

Despite the rapid growth in internet, less than a third of inhabitants in the developing world will be online by end of 2013. There is still a major job to be undertaken in connecting the unconnected. A 4th generation Regulator has to be working with and where required, managing Government led funding and private initiatives to secure universal services for broadband internet connectivity and achieving Digital inclusion. New creative funding mechanisms are required, supported by the whole of the ICT industry especially where taxation mechanisms are not well developed. Such schemes should recognise the benefits of community led and demand driven incentives with community wide involvement to achieve sustainable service. Incentives can be financial, such as the removal of taxation for a period, or could be non-financial such as allocation of additional spectrum upon achieving certain quality or coverage targets. In some cases regulators are able to play a role in investment by lowering the costs of doing business by deferring license fees and taxes, as well as implementing rules that enhance efficiency. Regulators can also play a key role in increasing confidence, reducing risk and encouraging investment in the ICT sector overall, through good governance, adopting and practicing sound regulatory principles of transparency, non-discrimination and consultation.

The 4th Generation Regulator, in balancing the openness of the internet world with the regulated telecommunication and broadcast world, should adopt, wherever possible, self or co-regulatory measures, balancing protection of the consumer and provision of quality service, whilst enabling operators a free hand to innovate and compete. The success very much depends upon the behaviour of the operators and suppliers. Simply, less anti-competitive behaviour results in less regulation being needed. Regulations exist, and will continue to be required, where the regulator needs enforcement powers, such as setting interconnection charges in the event of disputes, or fining an operator for failing to interconnect in a timely manner.

Communications services are converging over increasingly converging IP based networks. Consumers are expecting TV, film, radio, music, social networking as well as voice over their mobile smart device, anywhere and at any time. And they are expecting such services to be delivered reliably and without interruption. In the growing digital ecosystem, the 4th generation regulator is deeply involved with consumer protection. The regulator is being drawn into issues of dealing with inappropriate material, mis-selling and fraudulent activities. The 4th generation Regulator has to be taking action, within the scope of ICT regulation, to support the protection of public interests such as health, safety, personal data, the environment, and social cohesion. The 4th generation Regulator has a key role to play in coordinating cross boarder activities in protecting privacy of information, or indeed enabling lawful interception or tracing, at the same time building trust of consumers in content and security of information. This is a subject where further international legislation is under consideration. The 4th Generation Regulator could play an important facilitating role in the significant level of training required, especially in developing countries, in explaining the benefits of ICT in supporting health and education, rural development as well as the dangers of the internet. It is important the regulator has well established processes and procedures to work in a collaboration with a wide range of national, regional and international stakeholders involved with economic and social development.

Over the top (OTT) service providers expect, and Regulators require, that network operators deliver services on a non-discriminatory basis ensuring net neutrality. Network operators have to adjust their business models to ensure they are properly compensated for the bandwidth provided to deliver OTT services with an appropriate quality of service.

Services being provided over mobile smart phones and tablets used externally and within buildings, are putting pressure on the availability of spectrum. The 4th Generation Regulator has to develop smart ways of assigning spectrum so as to encourage spectrum efficiency and provision of broadband services in rural and uneconomic areas. Consideration should be given to renting spectrum to operators; if they do not use it then they lose it. Such an approach removes the issue of paying high capital costs, costs which otherwise could be used for infrastructure development or lowering retail tariffs. Further there is no point in a service provider seeking spectrum, to deliver high speeds, if their network design results in constant retransmissions due to poor quality of service.

Technology is continuously advancing and industry should be able to use any technology without being held up by the need to change regulations. Regulations need to be, as much as is practical, technology neutral. This can be

assisted through the adoption of Unified Licences enabling any service to be delivered over any technology. All proposed, or revisions of regulations, should follow a defined public and proactive consultation process.

Regulators have to be aware of the cost of regulation. Convergence of services is driving regulatory requirements and oversight also to converge. There has been a growing trend to bring together different regulatory bodies. The objective of such mergers generally is to increase efficiency of regulation and achievement of policy objectives. Regulations can be developed by either a single converged regulatory entity or a closely coupled group of regulators. Benefits can be obtained through harmonizing regulation across different communications services in order to support efficiency, fairness and clarity for service providers and the general public. Such convergence should also assist in the cost reduction of regulation. Regulators should strike an appropriate balance between permanent and temporary staff to cope with a diverse set of services and dynamically changing market, keeping facility costs down.

Government and public services are generally the largest employer and largest spender on communication services. A sound ICT Policy and mechanism to progressively have all public services provided over ICT and the digital ecosystem will provide a major boost to private sector investment. This assumes that public services will largely be run over public communications services rather than a government owned private network.

The arguments for cooperation between regulators are high and can bring substantive benefits through sharing best practice. The arguments for centralising some of the regulatory activities in regions which have very strong common goals and legislation focus mainly around efficiency in production of common policies, guidelines and regulations. Due to variation of local market condition, the implementation of regulation could be argued as best being on a local or national level.

The 4th generation Regulator differs in emphasis from the previous generations of Regulator. The regulatory purpose of a 4th generation Regulator is focused on supporting Government in tackling the growing social and economic issue exacerbated by our ever growing population and the need to manage our environment in the face of austerity measures. The digital ecosystem enabled by: smart phones, high speed networks, convergence, cloud computing, over the top services, the universal connection of people, connection to the world's information databases and 'things', is providing opportunities for more effective working and achievement of social goals for health, education and economic development.

Through effective cooperation of all stakeholders and the right balance of regulation, together we can combat the negative activities over the digital ecosystem and maximise the immense benefit the digital ecosystem can bring to the people of our world.

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